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Bos

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[45] **Mar. 4, 1975**

[54] **MACHINE FOR BINDING TOGETHER A NUMBER OF BARS, TUBES OR SIMILAR ELONGATED OBJECTS**

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[22] Filed: **July 31, 1973**

[21] Appl. No.: **384,367**

[30] **Foreign Application Priority Data**

Feb. 3, 1972 Netherlands 7201437

[52] **U.S. Cl.** ..... **53/198 R,** 156/446, 156/522

[51] **Int. Cl.** **B65b 13/04,** B65b 27/10

[58] **Field of Search** ..... 53/198 R, 198 A, 214, 389; 30/124; 156/446, 522; 100/7

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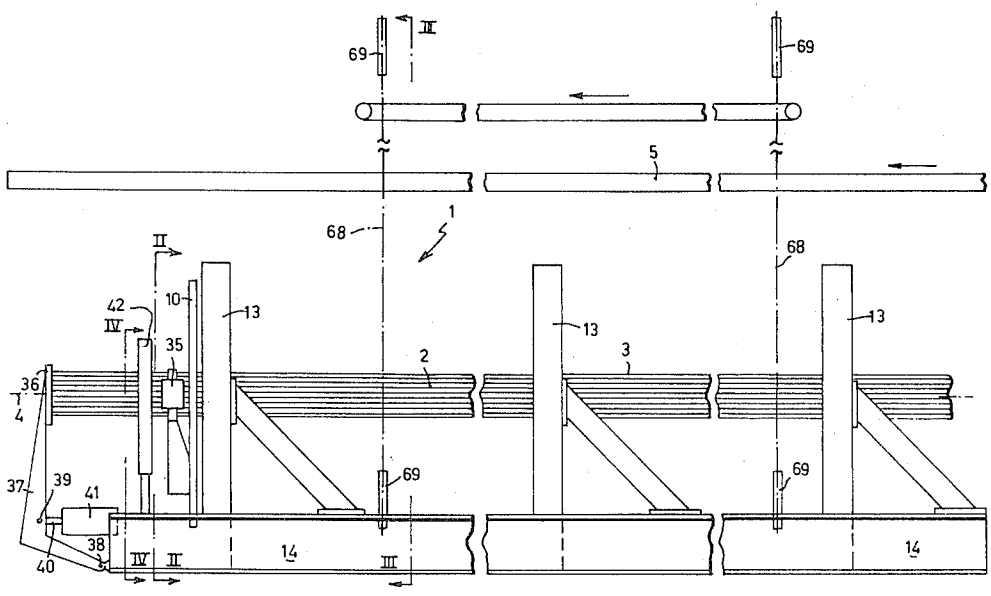
Assistant Examiner—Horace M. Culver
Attorney, Agent, or Firm—Browdy and Neimark

[57] **ABSTRACT**

A machine for binding together a number of bars, tubes or the like elongated objects by means of an adhesive tape including means for holding the objects in parallel relationship, clamping means for clamping the objects into a compact bundle, the clamping means and objects to be clamped being rotatably supported to the frame about the longitudinal axis of the bundle to be formed and means for supplying tape from a reel supported on the frame which is movable to the periphery of the bundle to be formed and away therefrom.

9 Claims, 5 Drawing Figures



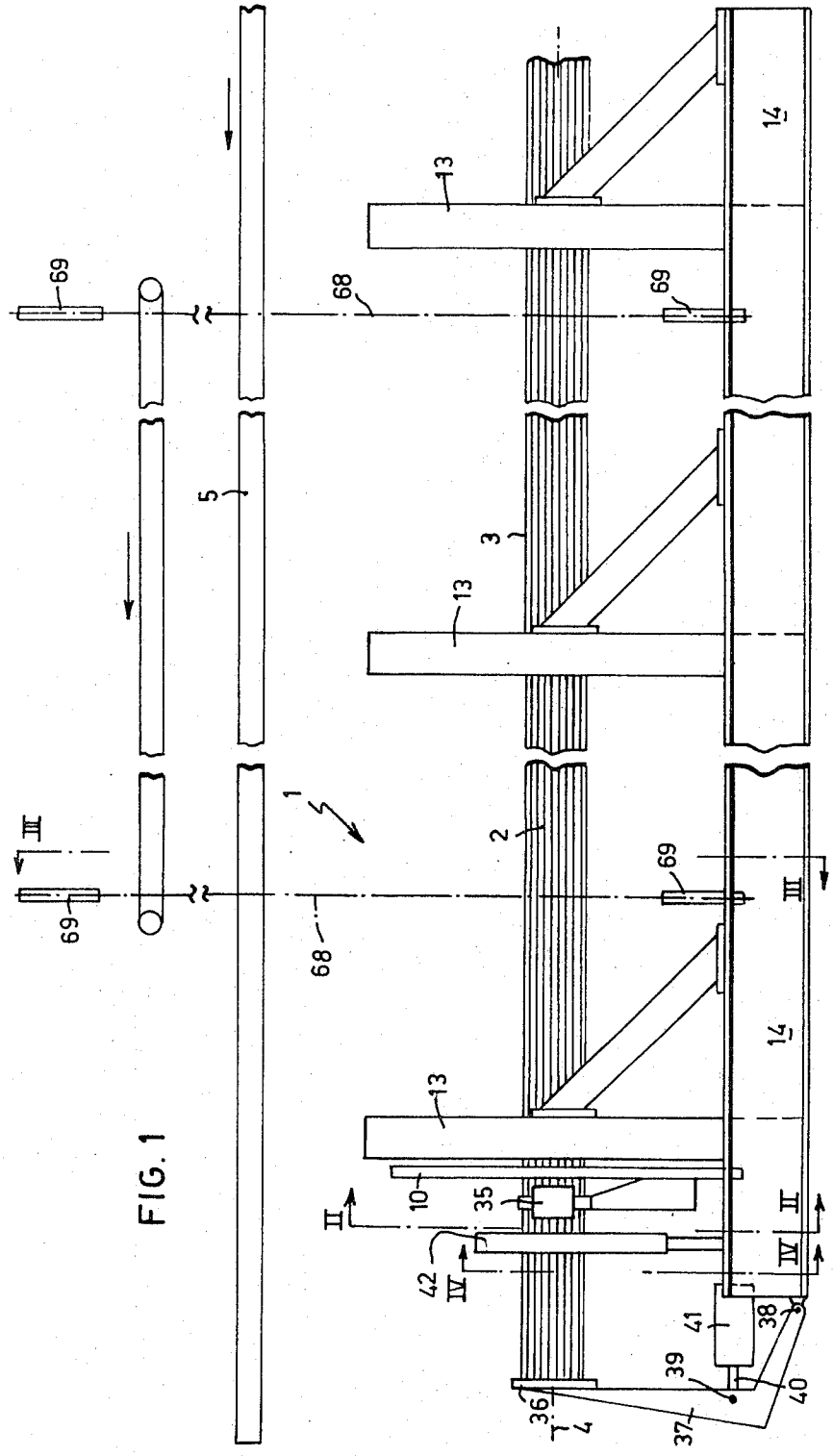


FIG. 1

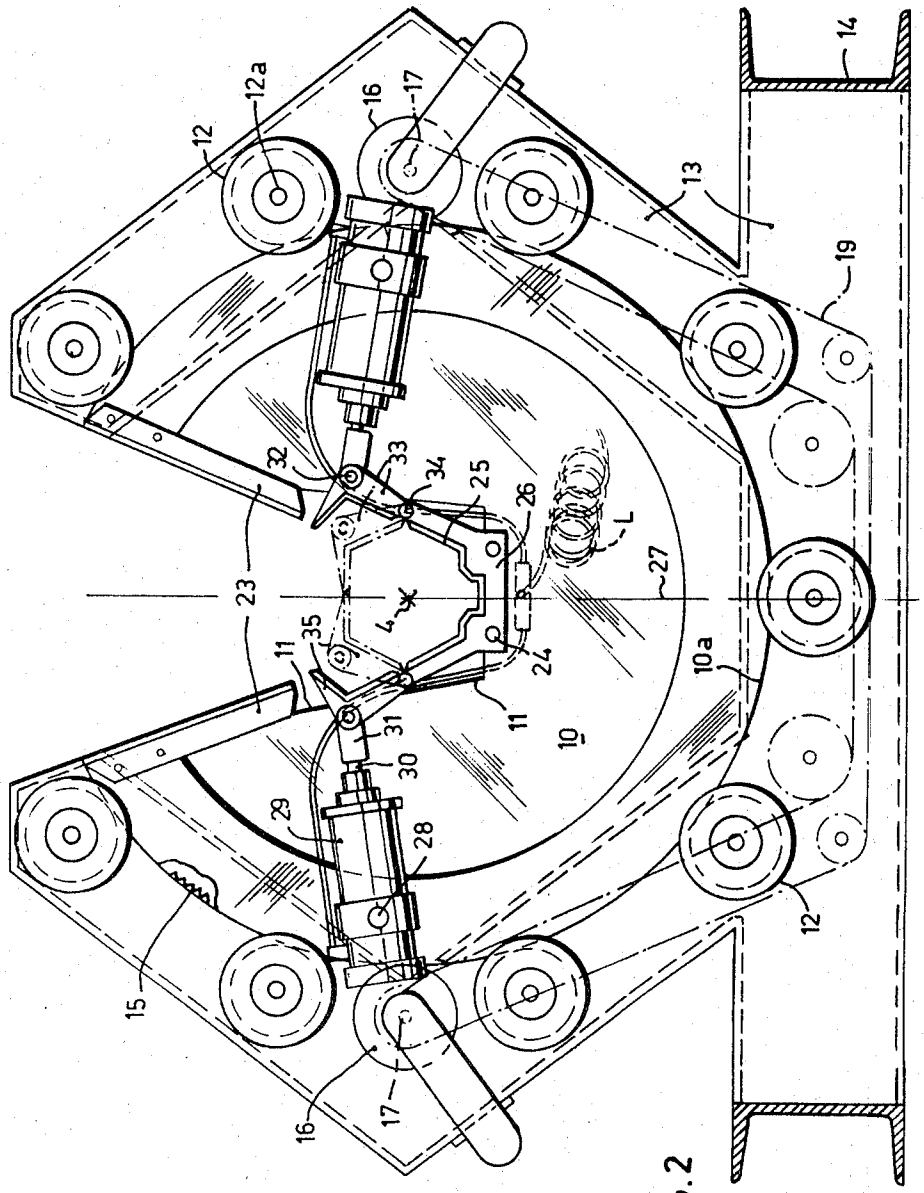

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FIG.2

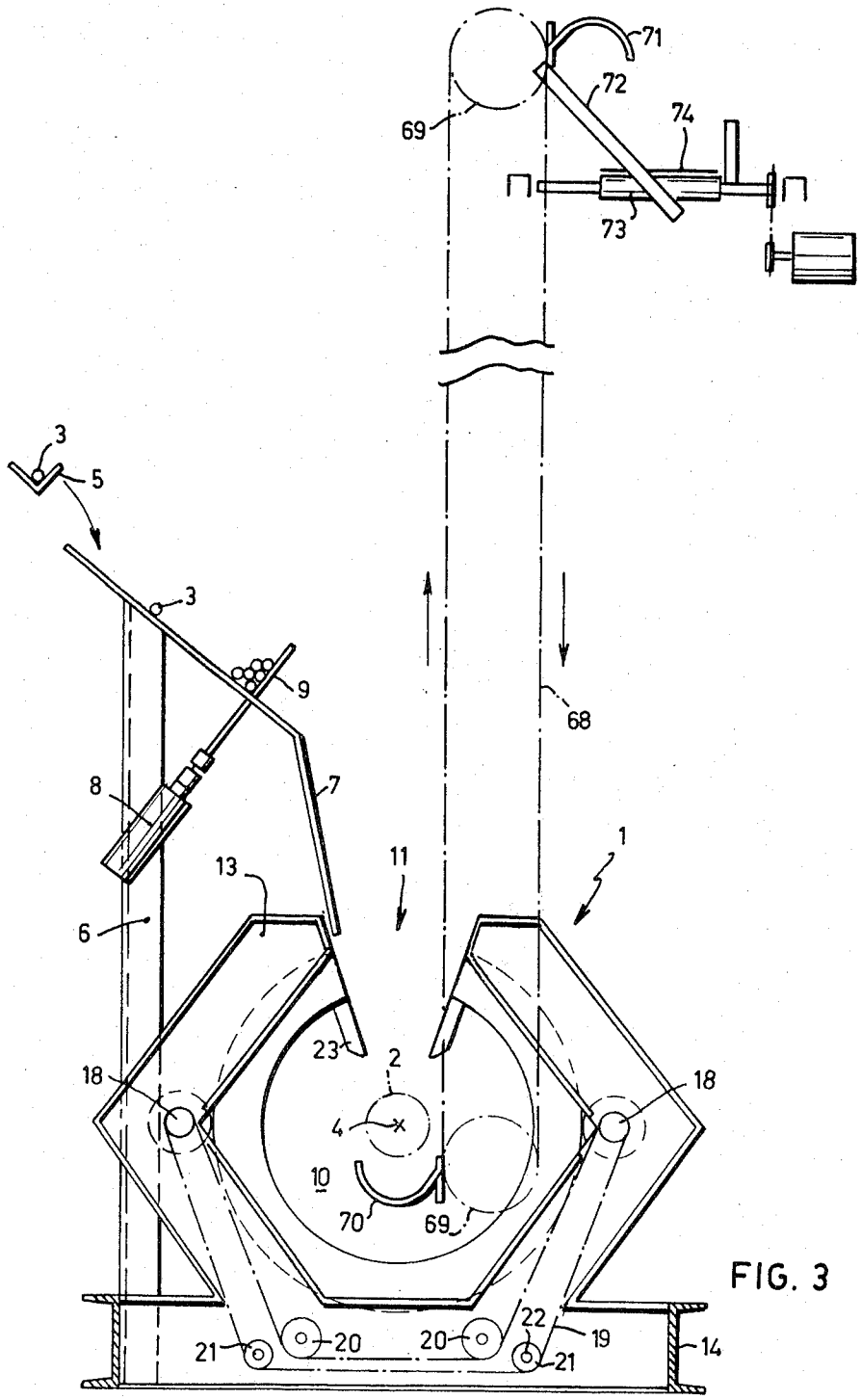
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FIG. 3

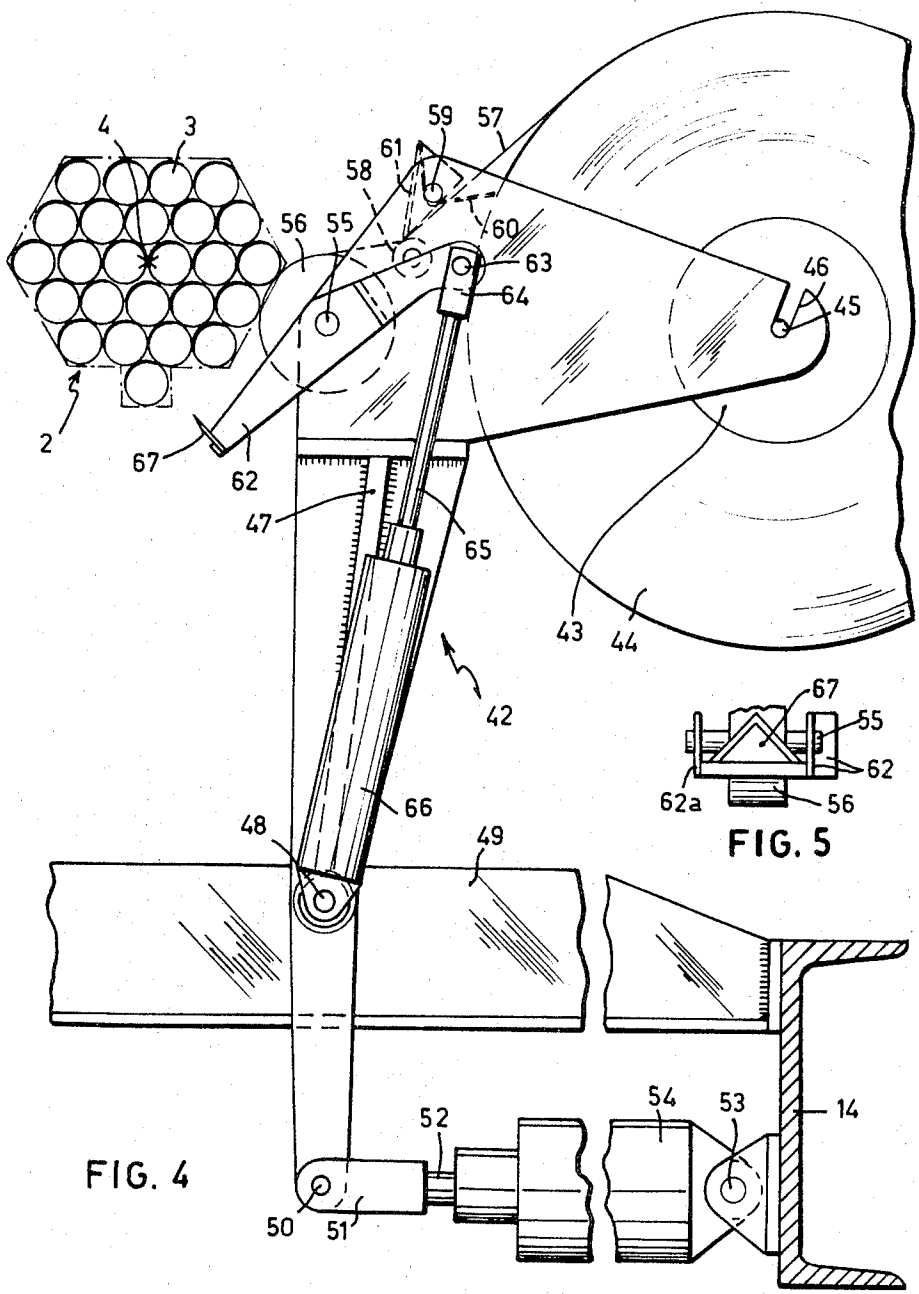
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FIG. 4

67
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62a
56

FIG. 5

MACHINE FOR BINDING TOGETHER A NUMBER OF BARS, TUBES OR SIMILAR ELONGATED OBJECTS

The present invention relates to a machine for binding together a number of bars, tubes or similar elongated objects, by means of an adhesive tape, said machine being provided with means for supporting and holding said objects mutually parallel, and also means for supplying and guiding the tape from a reel transverse to the objects.

In machines of this type the objects are usually supported fixed to the frame and the machine is provided with a mechanism with the aid of which the tape reel is rotated several times around the bundle of objects, after the free tape end has been fixed to a point on the periphery of the bundle of objects. In practice said embodiment of the machine, in which, in connection with the arrangement of the mechanism for rotation of the tape reel, the supply of the objects takes place in longitudinal direction of the objects, which may be onerous in case of larger length sizes, appears to lead to low dependability whereas the relatively high costs of construction are not too attractive.

The present invention aims at providing a machine of the type as described in the preamble, in which has been tried to eliminate the objections of the known embodiment, as well as to increase the productivity. To that end in the embodiment of the machine according to the invention, one or more transverse supports for the objects are present, said supports being mutually spaced in the longitudinal direction of the machine, and clamping means have been arranged adjacent at least one of said transverse supports, said clamping means being active from aside on the supported objects, by which clamping means the objects may be combined into a compact bundle, said clamping means, together with the objects to be clamped, being rotatably supported to the frame about the longitudinal axis of the bundle to be formed, whereas adjacent at least one of the clamping stations for the objects to be clamped, a member supported on the frame and carrying along the free tape end being movable to the periphery of the bundle to be formed and away therefrom. Since the bundle of objects rotates about the longitudinal axis thereof, the tape, after its free end has been brought into contact with the periphery of the bundle, is simply unwound from the spatially fixed arranged reel, which stimulates a quick course of the binding of the bundle.

In a preferred embodiment of the binding machine according to the present invention, the transverse support constitutes the bottom of a recess in a disc-shaped means, said recess extending from the periphery of said means to beyond said axis of rotation, said disc-shaped means being rotatably supported in the vertical plane by means of a number of support rolls arranged along the periphery of said means, each of said support rolls being rotatable about a fixed shaft connected to the frame, in which the said clamping means are movably positioned adjacent the recess of the disc-shaped means. In said embodiment of the binding machine according to the present invention, the recess of the disc-shaped means permits in a simple way supplying of the objects to be bundled transverse to the longitudinal axis of the machine.

In a further embodiment of the binding machine according to the present invention, the clamping means

are constituted by two levers provided with a claw, which levers each being swingable in a manner about an axis directed transversely to a side face of the disc-shaped means and arranged reversed symmetric with respect to a centre line of the disc-shaped means passing through the said recess, such that the objects to be arranged in the recess, are clampable to a compact bundle between a surface at the recess bottom and an engaging surface at each of the said claws, the longitudinal axis of said bundle being concentric with the axis of rotation of the disc-shaped means.

Moreover, in the binding machine according to the present invention, the member carrying the free tape end, is constituted by a guide and pressure roll, which is rotatably arranged at the angle portion of a cantilever, at which free lever end also the reel for the tape is supported and which cantilever is swingable to the frame adjacent its other lever end in a plane transverse to the longitudinal axis of the machine such that the tape end is adapted to be pressed via said guide and pressure roll against the periphery of the bundle to be formed.

In an embodiment of the binding machine according to the present invention preferably on the rotational shaft of the guide and pressure roll, also at both sides of said roll, a lever is rotatably supported, a cutting blade, having the shape of an isosceles triangle with an acute apex angle, of which angle the legs constitute the knife edges and of which the base is parallel to the axis of rotation, being secured transversely to the free end of which of the levers extending beyond the periphery of said roll. Since in the previously described embodiment and arrangement of the knife blade, the tape part leading from the reel to the windings around the bundle will almost be hit in the centre line on movement of the cantilever, the separation of the tape can take place in a faultless way. The apex angle of the knife blade lies advantageously between 60° and 70°.

In an embodiment of the binding machine according to the present invention advantageously the free end of the cantilever, the claw-levers and the knife levers is pivotally connected to a piston-cylinder mechanism, the supply conduits, in particular those which lead to the mechanisms of the claw-levers, consisting of flexible material and being shaped according to a helical line having a large number of convolutions. An embodiment of the present invention will now be described with reference to the accompanying drawings, in which:

FIG. **1** is a side-view of the binding machine a device for separately supplying of the objects to the machine and a device for discharging the objects bound together to a bundle from the machine, being shown schematically,

FIG. **2** is a cross-section along the line II—II of the machine in FIG. **1**, to illustrate a disc-shaped means,

FIG. **3** is a cross-section along the line III—III of the machine in FIG. **1**, to illustrate the supplying device and the discharging device.

FIG. **4** is a cross-section along the line IV—IV of the machine in FIG. **1**, to illustrate the binding device, and

FIG. **5** shows a detail of the knife blade and its levers.

The machine shown in the drawing, generally indicated by **1** (seen in particular FIG. **1** and **3**) is intended for binding a number of tubes of synthetic material **3** to a bundle **2**. An extrusion-machine, not shown, continuously supplies the tube material via a channel-

shaped guide **5**, positioned at the front side of the binding machine above and parallel to its longitudinal axis **4**. As soon as the tube material has the required length, it is severed, for instance by pushing against an electrocontact, not shown, which is adapted to actuate a sawing mechanism, not shown, after which the tube **3**, for instance with the aid of several movably arranged parts (not shown) of the channel **5**, may be lifted from said channel and may fall sidewardly on a number of guide strips **7**, inclining downwardly from adjacent below the channel **5** up to a certain distance above the longitudinal axis **4** of the machine, said strips being mutually parallel and supported to supports **6** of the machine. To a certain part of some of the said guide strips a piston-cylinder mechanism **8** has been arranged, by means of which mechanism a bar **9**, connected to the piston of said mechanism, can be brought transverse to the strip **7** and inclining upwardly in the path of movement of the continuously supplied tubes **3**, which can be caught by the bars **9** in case the binding machine is in operating condition. For that purpose for instance an electronic pulse counter, coupled to the above mentioned sawing mechanism, can be used, by means of which pulse counter the tubes **3**, admitted to the guide strips **7**, can be counted, and, as soon as the required number of tubes have passed — the time necessary for bundling a preceding group of tubes in the machine and then discharging same from the machine, will be amply sufficient — a signal for withdrawing of the bars **9**, which, after passing of the blocked group of tubes will return by spring action into their blocking position, can be passed to the mechanism **8** as well as a signal for actuating of the binding machine. The parts **6–9** have not been shown in seen in.

The binding machine **1** has been provided with a number of metal disc-shaped members or binding discs **10**, arranged mutually spaced and transversely to the longitudinal axis **4**, only one of which being shown schematically in FIG. **1**, and more clearly, in FIG. **2** and **3** in front and back view respectively. The binding disc **10** (seen in FIG. **2**) has a recess **11**, extending from the circle periphery **10***a* to beyond longitudinal axis **4** of the machine, said axis **4** also passing through the centre of the disc **10**.

The binding discs **10** (see in particular FIG. **2**) each being supported by a number, for instance **9** of identical flanged support rolls **12** arranged along the periphery **10***a* of the disc, are each freely rotatable in a vertical plane about their centre **12***a* as axis of rotation. Said flanged support rolls **12**, for instance made of synthetic material, are each freely rotatable about a shaft **12***a*, directed parallel to the longitudinal axis **4** and fixed to the side face of a platemetal U-shaped support **13**, the said side face being arranged closed and parallel to the face of the binding disc, said U-shaped support **13** being fixedly connected to the base **14** of the machine frame.

Due to said arrangement, the binding disc **10** is adapted to rotate about the centre **4** in a plane parallel and close to the support **13**. The disc **10** is also provided with a chain **15** extending along the whole peripheral edge **10***a* of the disc to both opening edges of the recess **11** and held tight in a circumferential groove, the said chain **15** engaging with two chain wheels **16**. The shafts **17** of said wheels **16** are, at the rear side of the U-support **13**, provided with a second chain wheel **18** seen (also in FIG. **3**) over which a chain **19** has been laid, which further runs over chain wheels **20** and **21**, borne at this side of the support **13**. The chain wheels **21** of the series of supports **13**, arranged near to the rear side of the frame **14**, can be wedged on a same shaft **22**, so that the binding discs can be driven simultaneously.

In the starting or rest position of the binding discs **10** the recess **11** is directed upwardly (seen in FIG. **2**) having angle irons **23**, fixed at one side face of the disc **10** along the edges of the recess, for guiding of the tubes **3**.

In this position of the discs **10**, the bottom **11***a* of the recess **11** could constitute a support for the group of tubes **3**, coming down from above via the fixed guides **7**, after withdrawal of the bars **9** by the mechanisms **8**. In the embodiment shown however, a U-shaped support **26** is present, having a certain profile **25**, and attached by means of bolts **24** close to the recess bottom **11**a at the front side of the binding disc (**10**), said support **26** being shaped reverse-symmetrically with respect to the center line **27** of the binding disc, passing through the center of the recess **11**. Also reverse-symmetrically, a shaft **28** has been arranged parallel to the axis of rotation **4** at both sides of the recess **11**, to which shaft **28** a piston-cylinder mechanism **29** is pivotally connected. The piston bar **30** of said mechanism carries at its free end a bridge piece **31**, which is pivotally connected with a pivot pin **32** at a lever **33**, which itself, by operation of the mechanism **29**, may be swung about a pivot pin **34** provided at the end of the U-shaped member **26**, towards the centre of the disc **10** and therefrom. The levers **33** are profiled at the facing side edges thereof to form a claw **35**, such, that after operation of the mechanisms **29** to the closing position of the levers **33**, a certain number of tubes **3** may be clamped to a compact bundle **2** between the claws **35** and the U-shaped support **26** (seen in also FIG. **4**).

Before the tubes **3** are clamped together, they are arranged with one end coinciding with a transverse plane by means of a flat plate **36**, at one end of the cantilever **37**, which lever is adapted to be swung in the vertical plane passing through the longitudinal axis **4** (vide FIG. **1**), by means of a pin **38** fixed at its other end and pivotally connected to the basis **14**.

At a pivot **39**, positioned adjacent to the angle portion, the cantilever **37** is pivotally connected with the piston bar **40** of a piston-cylinder mechanism **41**, being itself pivotally connected with the basis **14**. By operation of the mechanism **41** the tubes are pressed with their other end against a stop plate (not shown), arranged at the other end of the basis **14**, after which the lever **37** is returned to its starting position by the mechanism **41**.

After levelling of the tube ends and after clamping together the tubes **3** to a bundle **2**, the common drive of the binding discs **10** is operated, due to which the bundle **2** is rotated several times about the longitudinal axis **4**, during which movement the bundle is bound together with the aid of a binding mechanism, arranged adjacent to one or more of the binding discs.

Such a binding mechanism, generally indicated by **42** in FIG. **1** and shown in detail in FIG. **4**, substantially consists of a reel **43** on which adhesive tape has been wound to a roll **44**. The reel **43** has rotationally been supported by means of a transverse pin **45** resting in a slot-shaped bearing **46** at one end of the cantilever **47**, which is adapted to be swung in a plane transverse to

the longitudinal axis 4 of the bundle, about a pin 48 on the transverse beam 49, connected to the base 14. At the end extending beyond the pin 48, the cantilever, by means of a pin 50 is pivotally connected to a bridge piece 51, itself being connected to a piston bar 52 of a piston-cylinder mechanism 54, which is adapted to be swung about a pin 53 fixed to the base 14.

Close to the angle portion of the cantilever 47, a guide and pressure roll 56 is freely rotatable about a shaft 55. The adhesive tape 57 runs from the roll 44 via a little roll 58 to the pressure roll 56 and is held ready, such that, by operation of the mechanism 54, the free tape end is moved from aside towards the bundle 2 and via the pressure roll 56 is pressed by the cantilever 47 against the periphery of the bundle. Then, on operating the driving mechanism of the binding machine, the clamped bundle 2 is rotated several times about the longitudinal axis 4. A brake member 61, adapted to be swung about a little shaft 59 at the cantilever 47 under influence of a spring 60, can then hold the tape 57 pressed against the little roll 58.

Furthermore, on the shaft 55 a lever 62 is pivotally supported at its centre, the end of the lever 62, facing away from the longitudinal axis 4, being pivotally connected by means of a pin 63 to a bridge piece 64, itself being connected to the piston bar 65 of a piston-cylinder mechanism 66, which is pivotally connected to the transverse beam 49, by means of the pin 48.

After the driving mechanism of the binding machine has been stopped again, the mechanism 54 is again acutated, to swing the pressure roll 56 together with the cantilever 47, away from the periphery of the bundle, back to the starting position. During said swinging movement the lever 62 is swung by operation of the mechanism 66 such, that a knife 67, fixed at the free end of said lever 62, is adapted to severe the end of the tape wound about the bundle and leading from the roll 56 to the periphery of the bundle.

In order to have the severing of adhesive tape strengthened with glass fibre or dralon, which is exclusively suitable for bundling, take place in a faultless way, the knife 67 (seen in FIG. 5) is embodied in a special way. For, the knife blade has the shape of an isosceles triangle with an apex angle of 60°–70°. The legs of the triangle constitute the knife edges, whereas the basis has been directed parallel to the axis of rotation 55 of the roll 56. Moreover, the knife blade has been connected transverse to the longitudinal direction of the lever 62 to the free end of the said lever extending beyond the periphery of the roll 56. By two times bending over 90°, of the part of the lever 62 which is arranged at the other side of the rotational support, the said lever end extends at some distance parallel to the other lever end, for rotational attachment thereof to the bridge piece 64. For better solidity, the knife blade has furthermore been attached to the free end of a short lever 62*a*, pivotally supported at the other side of the roll 56, on the shaft 55. The point of the knife 67 hits the adhesive tape approximately in the longitudinal centre line, whereby the tape is separated along both knife edges during the last part of the return movement of the lever 47.

After this, the bundle is wound back a like number of times by the driving mechanism of the machine, in order to relieve the feed lines L, leading from a feeding source (not shown), fixedly arranged at the frame 4, to the mechanism 29, the said feed lines L being twisted by the rotation of the binding discs, and in order to bring the binding discs 10 back to their starting positions, the recess ll thereof being directed upwardly.

After binding together of the tubes, the bundle can be upwardly removed from the binding discs with the aid of a discharging device, schematically shown in FIG. 1 and 3, for which first the mechanisms 19 are operated to free the clamping means 33, 35. Two chains 68, being lead over chain wheels 69, arranged vertically one above the other, the lower one for instance of the said chain wheels, being drivable, have been arranged at a suitable distance behind the longitudinal axis 4 (seen in FIG. 3) and mutually separated in said direction at a suitable distance. At each of the two chains two hooks 70, 71 are arranged such, that on driving the chains, for instance first the one pair of hooks 70 may seize, during upward movement, just under the bundle, to deliver them, via downwardly inclining guides 72, at the top of the discharging device to a conveyor belt 74, guided horizontally over rolls 73, which conveyor belt may further discharge the bundle in longitudinal direction.

The binding machine may be driven completely automatically by suitable operation of the used piston-cylinder mechanisms.

I claim:

1. An apparatus for binding together a plurality of bars, tubes or similar elongated objects including;

a frame having a longitudinal axis, and including at least three supports transverse to said longitudinal axis;

a disc-shaped member rotatably mounted on each of said transverse supports, each of said disc-shaped members including a recess extending from a portion of the periphery of said disc-shaped member radially inwardly and having an inner portion, said inner portion of said radial inward extension of said recess extending beyond the axis of rotation of said disc-shaped member;

a substantially U-shaped support mounted on each of said disc-shaped members to coincide with said inner portion of said recess, said U-shaped support having first and second substantially vertical arms;

first and second claw members each being pivotally attached respectively to said first and second vertical arms;

claw member pivoting means, mounted on said disc-shaped member, for pivoting said first and second claw members inwardly fo form with said U-shaped support an enclosure completely around the objects, said enclosure having an axis of rotation substantially coinciding with the axis of rotation of said rotating disc member;

rotating means for rotating said rotating disc member; and

tape supply means for supplying and guiding tape to the objects rotating with said rotating discs from a direction transverse to said longitudinal axis.

2. The apparatus of claim 1, wherein said tape supply means comprises:

a cantilever having an elongated section and a short section substantially perpendicular to said elongated section, said elongated section being pivotally mounted on said frame;

cantilever pivoting means to pivot said cantilever;

a tape reel rotatably mounted on said short section

a pressure roller rotatably mounted on said cantilever substantially at the junction of said elongated section and said short section;

said cantilever being disposed on said frame such that when said cantilever is pivoted by said cantilever pivot means said pressure roller engages said objects; and

means for feeding the tape from said tape reel to said pressure roller.

3. The apparatus of claim **2,** further including cutting means connected to said cantilever for causing the tape to be cut.

4. The apparatus of claim **3,** wherein said cutting means comprises a pivotable support lever mounted on said cantilever for pivoting about the axis of said pressure roller;

support lever pivoting means for pivoting said support lever; and

a cutting blade mounted on said support lever;

said support lever being pivoted by said support lever pivoting means, when said cantilever is pivoted to disengage said pressure roller from said objects, thereby causing said cutting blade to sever the tape between the objects and said pressure roller.

5. The apparatus of claim **4,** wherein said claw member pivoting means, said cantilever pivoting means and said support lever pivoting means comprise respectively first, second and third hydraulic piston means each including hydraulic supply lines

6. The apparatus of claim **5** wherein the hydraulic supply lines of said first hydraulic piston means consists of flexible tubing of helicoidal shape and having a plurality of convolutions.

7. The apparatus of claim **4** wherein said cutting blade is in the shape of an isosceles triangle having an acute angle, said blade being connected to said support lever, at the base thereof and having knife edges at the isosceles legs thereof.

8. The apparatus of claim **1,** further including feed ramp means for feeding a predetermined number of the objects into said recesses of said disc-shaped members under the influence of gravity.

9. A binding machine according to claim **7,** wherein said acute angle of the cutting blade lies between 60° and 70°.

* * * * *

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 3,868,810

DATED : March 4, 1975

INVENTOR(S) : Fredericus Antonius Jozef BOS

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 3, line 34, delete "seen in" and insert therefor -- Fig. 1--

Column 4, line 42, delete "vide" and insert therefor --seen in--

Signed and sealed this 1st day of July 1975.

(SEAL)
Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents
and Trademarks